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Original Article

A study on the glycemic, lipid and blood pressure control of type 2 diabetes patients of Kerala

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ABSTRACT

Aim: Aim of the study was to detect the level of comprehensive diabetes control among the diabetic patients of Kerala, India.
Method: Patients (1200) were randomly selected from a diabetes care center. Their blood sugar and other biochemical and anthropometric measurements were done and statistically analyzed.
Result: Only 28.3% had their A1C at or below 7% and 45% above 9%. 1/3rd of the female and 1/5th of the male patients had CAD. The prevalence of hypertension was almost equal in both sexes. However, there was a statistically significant higher systolic BP (mean 162.12 mm Hg vs 147.49 mm Hg, p = 0.01044) among females. The total Cholesterol was above 200 mg/dl in 42.1% of males and 45.61% of females. The triglyceride was >150 mg/dl in 38.6% males and 50.88% females. Low HDL cholesterol levels were found in 20.07% of males and 41.12% of females (p = 0.0445). The mean LDL was 121.75 (±32.29247)
Discussion: The mean blood sugar values are found to be high which will lead to a predictable increase in vascular disease, which in turn will affect the quality of health and productivity of the individual and the economic growth of the society as a whole. Studies suggest that therapeutic interventions to improve glycemic control may reduce the risk of CVD and microvascular disease.
Conclusion: This study shows that the level of diabetes control in Kerala is unsatisfactory. We need more medications, better strategies, and more emphasis on glycemic management than we are currently able to apply.

1. Introduction

The incidence of Diabetes is alarming in both developed and developing countries. In US The incidence of diabetes in 2010 was 1.7 million new diagnoses/year; in 2012, it is increased to 1.9 million [1]. This means that we are going to have increasing numbers of cardiovascular events, cerebral vascular events, peripheral vascular and a number of other cardiovascular illnesses [2]. For the most part, diabetes has become the leading risk predictor for cardiovascular disease in most clinical cardiology settings. Proper control of hyperglycemia is imperative and significant in preventing both microvascular, and macrovascular complications in diabetes, and reduced control means an even more alarming increase in the complication rates [3]. The mean glycated Hb (HbA1c) levels as per the available Indian data are around 9% which is at least 2% higher than the goal prescribed by international bodies [11]. Aim of our study was to identify whether we have achieved a satisfactory level of diabetes control or not in our diabetic population. This study aims to determine the level of diabetic control among a group of diabetic patients visiting a North Malabar diabetic clinic of Kerala to assess the mean glucose burden among the diabetic population as it will help give a direction for the future planning of diabetes management.

2. Materials and methods

Type 2 diabetic patients were recruited from the OP clinic of the "Diabcare" diabetes care center, Manjeri that is an important secondary care center for diabetes for the whole of Malappuram district, which in turn represents a cross section of Malabar. All freshly detected diabetics and diabetics with established organ failures like renal impairment, cardiac failure, stroke and hepatic failure were excluded. Samples for the fasting blood sugar, Lipid Profile, HbA1c, Uric acid, Calcium and Fasting insulin levels were collected after at least 8 h of overnight fasting. Samples for post-prandial blood sugars was also collected after 2 h from the time of starting breakfast, after the patients taking their usual medicines/or Insulin if he/she is already on any. The study was conducted after getting informed consent. The study was approved by the IEC.

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The patients were examined for assessment of height, weight, Body Mass Index (BMI) and waist circumference and Waist – Hip Ratio (WHR). The BMI (according to the WHO criteria, <18.5 is underweight, 18.5–24.9 is healthy, 25–29.9 is overweight and 30 and above is Obesity. However, the modified Asian Criteria defines it differently with <18.5 underweight, 18.5–22.9 is healthy or acceptable risk, 23–24.9 is overweight or high risk and >25 is obese or very high risk was calculated after body weight in Kilograms and height in Meters (BMI = Weight in Kg/Height In M^2) were measured with subjects in light clothing and without chapal. Waist circumference was measured on standing subjects midway between the lowest rib and the iliac crest. Hip circumference was measured at the widest area in the gluteal region and the waist to hip ratio (WHR, according to the WHO criteria, for males normal was <1 and for females <0.9 and according to the modified Asian standards normal for men is <0.90 and for females it was <0.85) was calculated as a measure of fat distribution (central obesity), whereas BMI was considered a measure of over all adiposity. Two blood pressure readings were obtained from the right arm of the patients in a sitting position after 30 min of rest at 5 min intervals and their mean value was calculated. Systolic blood pressure ≥140 mm Hg or a diastolic blood pressure ≥90 mm Hg (or current use of anti-hypertensive medication) is defined as Hypertension [21].

Relevant medical history data was collected from the patients including the family history of diabetes and CAD in first-degree relatives. CAD was defined as using nitro glycerine; experiencing typical chest pain or having a history of previous Myocardial Infraction(MI). The information was validated against ECG changes (Minnesota codes 1.1–3, 4.1–4, 5.1–3) compatible with ischemic heart disease.

Blood Glucose was estimated by glucose oxidase-peroxidase enzymatic (GOD-POD), end point colorimetry single reagent chemistry method. Cholesterol estimation was done by enzymatic (Cholesterol Oxidase- peroxidase), end point colorimetry, single reagent chemistry, with lipid clearing factor (LCF). Triglyceride estimation was done by enzymatic {Glycerol 3-Phosphate Oxidase (GPO)/Trinder} end point colorimetry, single reagent chemistry with liquid clearing factor (LCF). HDL cholesterol was estimated using Polyethylene glycol-cholesterol oxidase-PAP (Expansion) end point colorimetry, two reagent chemistry with lipid clearing factor. Auto span semi auto analyzer was used for all the above procedures and calorimetric measurements. HbA1c was measured using Bio-Rad "in2it" HbA1C analyzer using 'Boronate Affinity Chromatography' method. Statistical Analysis of the data was done with the help of the SPSS v17.

3. Results

When the patients were categorized according to the blood sugar levels (fasting and post-prandial (Figs. 1 and 2), it was found that the majority of patients were loosely controlled. The mean fasting blood sugar was 156.73 (±54.0), and the postprandial was 232.94 (±6.42). Among them, 42.1% males and 63% females had a fasting blood sugar in the range of 141–200 mg/dl and 51.72% of males and 54.54% of females had post-prandial blood sugar in the range of 201–300 mg/dl. Only around 1/3 of the cases had reasonably good (FBS < 140 mg/dl and PPBS < 200 mg/dl) control of blood sugar with only 28.3% of patients having their A1C at or below 7% and 45% had their A1C above 9% which shows that majority of the study population had poor blood sugar control.

The analysis of prevalence of coronary artery disease (CAD) (Table 1) showed that 1/3rd of the female and 1/5th of the male patients had CAD. This showed that females had a significantly higher incidence of CAD. However, the prevalence of hypertension was almost equal in both sexes (males – 67.21% and females – 71.19%) (Table 2). However, there was a statistically significant higher systolic BP (mean 162.12 mm Hg vs 147.49 mm Hg, p = 0.01044) among females compared to their male counterpart. Regarding family history of diabetes, more than 50% of patients both among males and females had first degree relatives with diabetes (57.38% males vs 52.54% females).

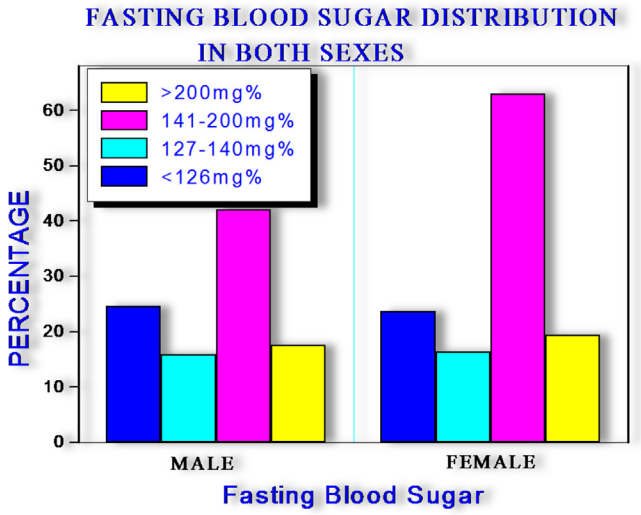

Fig. 1. Distribution of diabetics according to different fasting blood sugar ranges. In majority of cases, both among males and females, the fasting blood sugar levels are found to be high, indicating very poor levels of control of blood sugar in a significant number of diabetics.

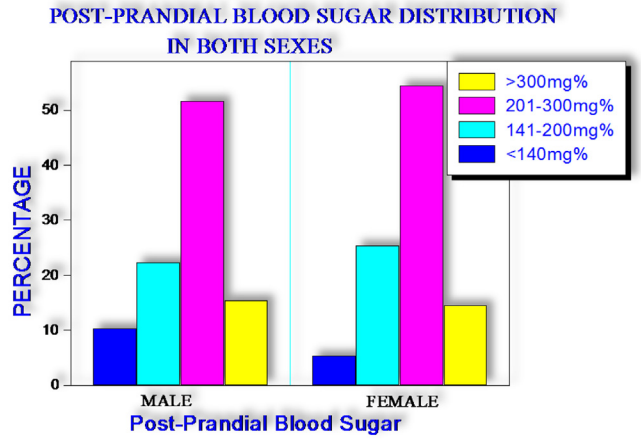

Fig. 2. Distribution of diabetics according to different post-prandial blood sugar ranges. Here also, majority belongs to the poorly controlled group.

Table 1
CAD among Diabetic Patients.

Male (610)	Female (590)	Total (1200)
120 (19.67%)	180 (30.51%)	300 (25%)

Table 2
HTN among Diabetic patients.

Male (610)	Female (590)	Total (1200)
410 (67.21%)	420 (71.19%)	830 (69.17%)

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